Bell Telephone

A Look Around—And Ahead • LEROY A. WILSON

Long Distance Finds the Way • WILLIAM H. NUNN

War-Time Taxes on Communication Services in 1949

Giving New Life to Old Equipment • PHILIP H. MIELE

Private Line Services for the Aviation Industry
HENRY V. ROUMFORT

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Autumn 1949

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A Medium of Suggestion & a Record of Progress

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LEROY A. WILSON, *President;* CARROLL O. BICKELHAUPT, *Sec.;* DONALD R. BELCHER, *Treas.*

Who's Who & What's What

in This Issue

THE ELECTION OF LEROY A. WILSON on February 18, 1948, to the presidency of the American Telephone and Telegraph Company followed by some 26 years the start of his Bell System career in the Indiana Bell Telephone Company. Two days after graduation from Rose Polytechnic Institute in Terre Haute, in June of 1922, he reported for work as a traffic clerk and student in Indianapolis. For some years with that company he had direct charge of the telephone operating forces in several districts throughout the state before returning to Indianapolis as district traffic superintendent in 1927.

Mr. Wilson transferred in 1929 to the Department of Operation and Engineering of the A. T. & T. Company in New York. His first work there was in the Traffic division, but he also gained experience in dial equipment engineering and in related fields. Ten years after his arrival in New York, he moved from the Traffic to the Commercial division of O. & E., where he was placed in charge of the work on telephone directories. The following year he was made rate engineer in the same division, and in 1942 he was appointed to head the entire Commercial division.

It was from this post that Mr. Wilson was promoted to an A. T. & T. vice presidency in 1944, with the assignment to study the revenue requirements of the Bell System; and it was during this period that he contributed "Reasonable Earnings to Insure the Best Service" to the MAGAZINE for Autumn 1945. His statements to stockholders at the last two annual meetings have appeared in these pages: "We Must Continue to Go Forward" in the issue for Spring 1948, and "Moving Ahead on Two All-Important Jobs" in that for Spring 1949.

THE FAMILIAR EXPRESSION of the "ideal and aim" of the Bell System in terms of "enabling anyone anywhere to pick up a telephone and talk to anyone else anywhere else, clearly, quickly, and at a reasonable

Leroy A. Wilson

William H. Nunn

Henry V. Roumfort

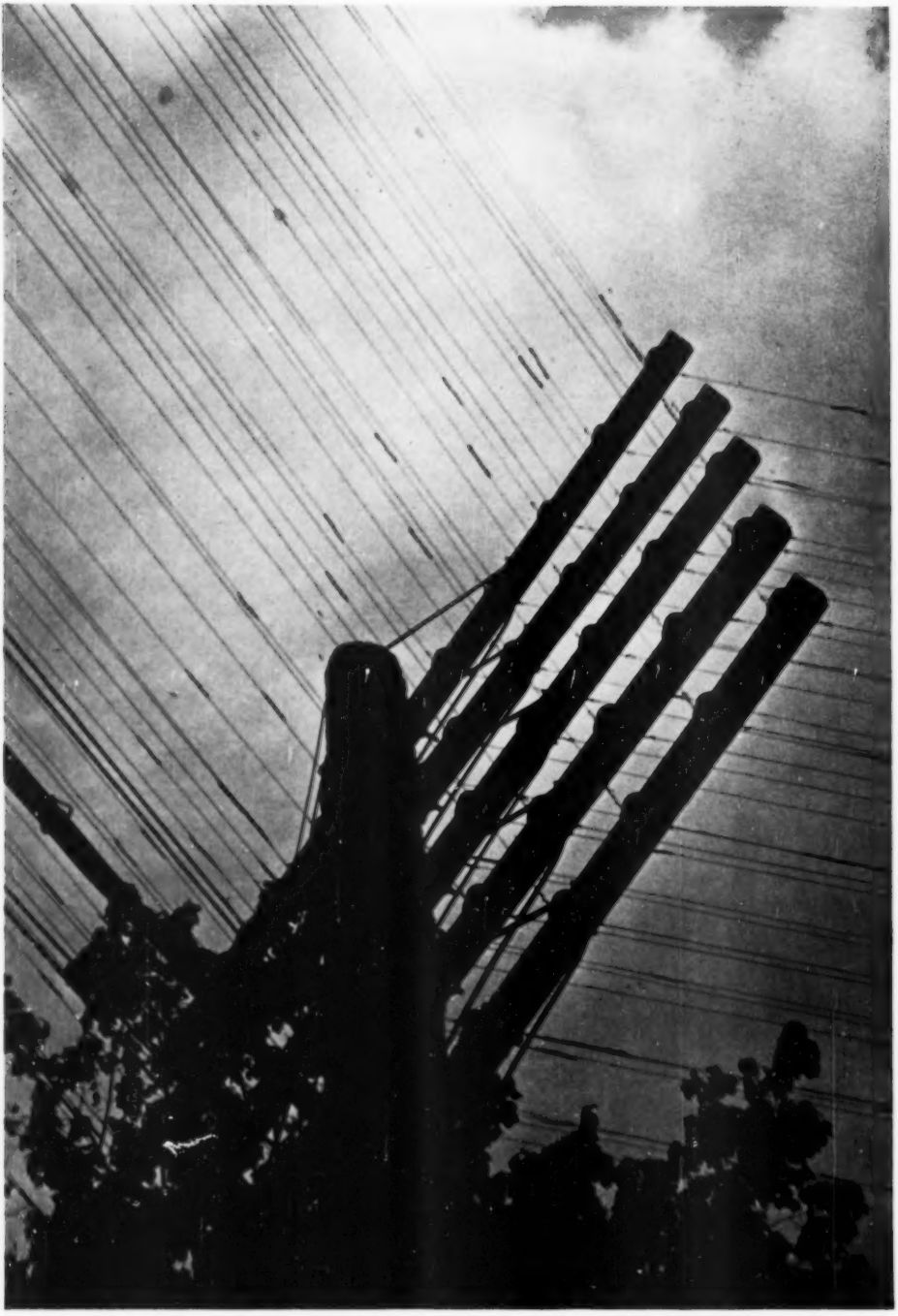
Philip H. Miele

cost" has many implications. What it takes to make good simply on the "anywhere" part of the statement is the theme of WILLIAM H. NUNN'S discussion of an important—if not widely known—Traffic activity. Mr. Nunn started his telephone career in 1915 in Los Angeles, with the Home Telephone Company, which later became part of the Southern California Telephone Company. After 13 years of Plant experience, he joined the Traffic Department in Los Angeles, and in 1935 he moved to Portland, Ore., as general traffic engineer, and remained there until 1940. After several years as general traffic engineer and as traffic operations engineer on the executive staff in San Francisco, Mr. Nunn became general traffic manager of the Northern California-Nevada Area of the Pacific Telephone and Telegraph Company. It was this position which he left last summer to become traffic facilities engineer in the Traffic division of A. T. & T.'s Department of Operation and Engineering. As is not infrequently the case in the exposition of a departmental operation, the present article reflects an effective collaboration, and Mr. Nunn wishes to acknowledge particularly the assistance of George L. Goudy, a member of his staff.

TELEPHONE CALLS cannot be mass-produced in advance and stored on a shelf until used. Each is "tailor made" to a customer's order. This is equally true with regard to what are known as private line services. These are individually designed to meet each customer's requirements, after careful study and analysis have been made of his particular needs for service and equipment by Commercial representatives of Bell System Operating Companies and the Long Lines Department. HENRY V. ROUMFORT, who describes some of the special communication services which the Bell System provides for commercial air lines, is private line sales manager for Long Lines, and has been responsible for the development of methods and practices for the sale of those services. His Long Lines career began with Division 2 Plant at Harrisburg, Pa., in 1926, and he has since served in the Commercial department in Washington, Philadelphia, and New York. His assignment to the general office in the last-named city dates from 1945.

NEWSPAPER REPORTING and radio news-editing preceded PHILIP H. MIELE'S two years as a French interpreter at General

(Continued on page 176)



A curve on a highway of speech. Pole, cross arms, wires, cable, all make a dramatic silhouette against the sky. *See "Long Distance Finds the Way," beginning on page 137*

The President of the A. T. & T. Company Discusses Some of the Obligations and the Opportunities Which Confront This Nation's Citizens in the Post-War Era

A Look Around—And Ahead

Leroy A. Wilson

The following paragraphs are from an address by Mr. Wilson before the biennial grand conclave of Kappa Sigma Fraternity at Swampscott, Mass., on September 8, 1949. Editor.

IN THINKING about current business and social problems, it seems to me we can gain a great deal of strength and courage by sharpening our awareness of what the people of this country have been able to accomplish over the years, and how they have been able to do it. In the last century they have created, and as a nation we now enjoy, the highest standard of living that has ever been achieved. That is not to say that everyone is well off, or that no one is in want. We know otherwise. But we also know that the people of the United States are relatively much better off, so far as their basic material needs are concerned, than the people of any other country, either now or at any time in the past.

We tend to take this for granted, but the fact is that it is one of the spectacular and significant achievements of man. Today, moreover, it is the United States of America from which many of the other nations of the world are drawing aid and strength in their efforts to rebuild their economies. Without getting into a discussion of the pros and cons of the process, I simply point to the obvious fact that they have depended on us for help, and that our success is the keystone of theirs. While some people are critical of the United States, we may well ask: where else in the world has so much been accomplished in behalf of so many?

Since so much depends on our success, it seems appropriate to consider what have been some of its basic ingredients. Each of us probably has his own notions about that—it being one of the characteristics of this country that all of us are free to have notions—but I'll mention several things that seem particularly important to me.

First, this country is physically big enough to have been able to grow into a position of leadership. Size by itself wouldn't be of much significance, but in combination with other things it has become important.

Second—and you might call this a function of size—we have great natural resources. However, we shouldn't overestimate these, for we don't have an abundance of everything we need and other nations have much greater resources than we have in a number of significant items.

Third, for many years we had plenty of room for continuous movement outward to the limits of our present geographic frontiers. We were growing and expanding. This stimulated habits of action and practical enterprise.

Fourth, the driving power of an expanding economy coincided in time with the development of technology. Each nourished the other so that the tools of industrial production multiplied with astonishing speed.

Fifth, competition flourished, the opportunity to compete was open to all, and individual enterprise was rewarded.

Sixth, and last on my list, the same fundamental political idea that gave each man the right and opportunity to compete for rewards likewise required him to recognize that every other individual had similar rights. I am well aware that there have been plenty of people in this country who have overlooked this. Nevertheless, we have on the whole been able to obtain the advantages of intense competition, and at the same time maintain respect for the rights of others.

I am sure we must continue to do this, and in fact be even more successful at it, if we are to meet our present responsibility and have the kind of life to which I imagine most of us look forward for ourselves and for our children. Freedom to think and to act, plus the stimulus of competition, are essential, but we shall have them only so long as we recognize the rights and needs of other people as individuals and deal with them accordingly.

THIS BRINGS ME to a subject that I believe is receiving increasing attention in industry today. I mean the building and keeping of good human relations among the members of any business or industrial organization, and particularly between the people who are being supervised and those who are doing the supervising, at all levels in the organization.

There isn't one of us who doesn't have a pretty clear idea of the things that make for good relations with other people. They are simple things—but so, so important! Just being polite is one of them. Being reasonable in what you ask someone to do, so that he understands why he is asked to do it, is another. Giving credit for a job well done is another. Each of us could make a fairly long list, and I think we'd agree that behind each list would be our recognition of the fact that the other fellow is an individual human being who wants the same consideration from us that we ourselves want from him.

What makes this subject so important is this—that if we don't take pains to treat people in industry as individual human beings, they won't be able to develop the individual resources and abilities that they could otherwise use to their own ad-

vantage and the advantage of society as a whole. Nor will they have the same capacity to accept and carry out responsibility, or even to feel their responsibility toward others.

This has some far-reaching implications. For example, in the last 20 years or so there has been a growing emphasis on ways and means of increasing people's security. Certainly no man can criticize another for wanting to be secure. Most people want that and always have. But there's an immense difference between *working* to achieve security and thinking that you have some inherent natural-born right to it. If that idea should ever run away with us, I'm afraid the burden on the nation would be backbreaking.

MY POINT here is simply that good human relations in industry are essential to encourage the resourcefulness and vitality that we must have as a nation to meet the tremendous demands placed upon us. Contrariwise, to the extent that men and women in industrial and business life are not treated as individuals, their capacity and willingness to contribute their utmost are discouraged. Not only does this lead to discord and poor morale; it also seems to me that in the long run it can weaken people—take away their spirit and will to work—and foster attitudes of "buck-passing" and dependency that as a nation we couldn't possibly afford.

This all boils down to the fact that each of us is encouraged to give his best when his human worth and also his human problems as an individual are recognized by others. I realize that in saying that I am not saying anything new. But it is heartening to find in business and industry these days an increasing response to the challenge of developing the best possible human relations, and I am sure the subject is worth all the constructive attention that we can give it.

BUSINESS is how most of us make a living, and the products of business are what make living in these free United States more comfortable and enjoyable than living elsewhere. That is not only true in peace times, but the productivity of our business produced that amazing array of equipment which gave our fighting forces at sea and ashore the tremendous power they had in the last war. That same capacity to produce, in my opinion, now keeps us at peace with Russia, for try as she will to drive her regimented and slave labor she knows she cannot match us.

The business and industrial machine was our first line of defense in war and our strongest argument for peace, as well as the basis of such abundant life as we possess.

And we are blessed, as I have said, with an infinitely greater abundance than any other people. Is that because we live in a rich continent? It is not significantly richer than Russia in material things, nor is it richer than western Europe except in one vital particular. The same races, the same kind of people that live in western Europe live here—but here there has been a greater degree of liberty and opportunity. Neither government, caste, nor tradition have kept people from the pursuit of happiness and the advancement of their well-being to the limit of their capacities. Able men from all conditions

rose rapidly to wealth or distinction. And as they rose, and received their rewards, they gave far more to the country than they got. The wealth their ideas and organizations created is what made these United States what they are today, and it is spread over the whole land in the living standards of the people.

We need more leaders, not fewer; more rather than less encouragement for ability; more rewards rather than less. Plans, statistics, bureaus, regulations—these things are in some degree necessary, but they never made a country. They are not creative nor productive. What makes a country is freedom and big men.

The road ahead isn't easy. There's an immense amount of hard work to be done. But with strong and humble faith in ourselves, and determination to meet our responsibilities, I'm confident, and I'm sure you are equally confident, that nothing can stop America.

U. S. Now Has 40,000,000 Telephones

THE NUMBER of telephones in the United States reached the 40 million mark in October. This is about twice as many telephones as there were in service ten years ago.

Of the total figure, about 32,900,000 telephones were served by the Bell System companies, and since then Bell System telephones have passed the 33 million mark. More than 7,100,000 are served by the nearly 5,700 independently-owned companies whose lines connect with those of the Bell System.

Twenty-seven million of the 40 million are residence telephones and the remainder are used by business.

The new total reflects a record-breaking gain of nearly 13 million telephones in the four years since V-J Day. This is more than the total number of telephones in service in the country in 1919, 43 years after the telephone's invention.

Such growth has stemmed from the heaviest demand for service in history. To meet the demand, the industry has added switchboards, cable, and other facilities at an unprecedented rate. Investment in telephone plant and equipment now exceeds ten billion dollars, an increase of four billion since the end of the war.

The post-war years also have witnessed a sharp increase in usage. Telephone conversations now average over 160 million a day, compared with the 1945 daily average of 111 million.

The United States, with an average of better than one telephone for every four persons, has nearly 60 percent of the world's total. For the rest of the world, there is only one telephone for every 80 persons.

Out of the 87,000 Recognized Places on This Continent, The Toll Operator Can Locate the One You Want and The Route to Take Your Call There

Long Distance Finds the Way

William H. Nunn

THE CUSTOMER says "Long Distance, I want to talk to Mr. John Smith at Palm Springs, California."

The long distance operator says "Thank you," and in a remarkably short time the customer has his wish —he is talking to Mr. Smith at Palm Springs, California.

To most people east of the Rocky Mountains, Palm Springs is just a name and it is unlikely that they would have any very clear idea of how to get there. It is not even a Bell System office, yet obviously this customer expects the operator to know the way to get there over the highways of speech. How does she do it?

You, the reader, have probably had the experience of planning a long automobile trip to some distant point. You remember the hours of poring over maps, and seeking advice from friends or a tourist agency. You recall how the travel advisor consulted reports and other data, and finally presented you with a marked map. But on the highways of speech that cover the nation—much as our network of roads—somehow we have come to expect the operator to find the way to our destination almost immediately after she has said "Thank you."

If the operator could see the tremendous network of communication paths that cover the country, she would probably think of the familiar road map. There are large main arteries between near-by big cities and express routes to important distant places. There are secondary trunk lines branching off at suitable places. There are a myriad of good connecting links of local importance, and there are countless country "lanes" to reach the farthest village and farmhouse. Altogether, more than 12,000 different highways of speech make the map look very black—certainly nothing to use as an instantaneous reference when one is in a

hurry. Of course, the operator can be expected to know the way over this network of speech highways to the next town or to the near-by metropolis. But wherever she may be —in Portland, Maine, or Portland, Oregon—she must also be able to get the call through quickly to Palm Springs, and to many thousands of other places as well.

EACH BUSINESS DAY, long distance operators are called upon to find the way on more than four million calls. Of course, most of these calls are concentrated to large cities and nearby towns, but many of them scatter. They may be directed to any one of the 71,000 cities, towns, or recognized localities in the United States proper, or to one of the 16,000 additional points in Canada, Cuba, or Mexico. Or the customer may wish to talk to one of the 13,000 vessels or nearly 8,000 cars and trucks equipped with telephones. Three thousand calls a day are made to vessels or to the 118 overseas points to which telephone service is available at present. The operator must be able to select the proper combination of routes; because, if she fails to, not only will excessive miles of speech highways be used, but the transmission may not be good and the customer will not have a satisfactory connection over which to talk.

With the expansion of operator toll dialing, still another reason for accuracy of routing comes into the picture; for the gains in speed which this method offers may be lost if the routing is incorrect, or takes too long to obtain.

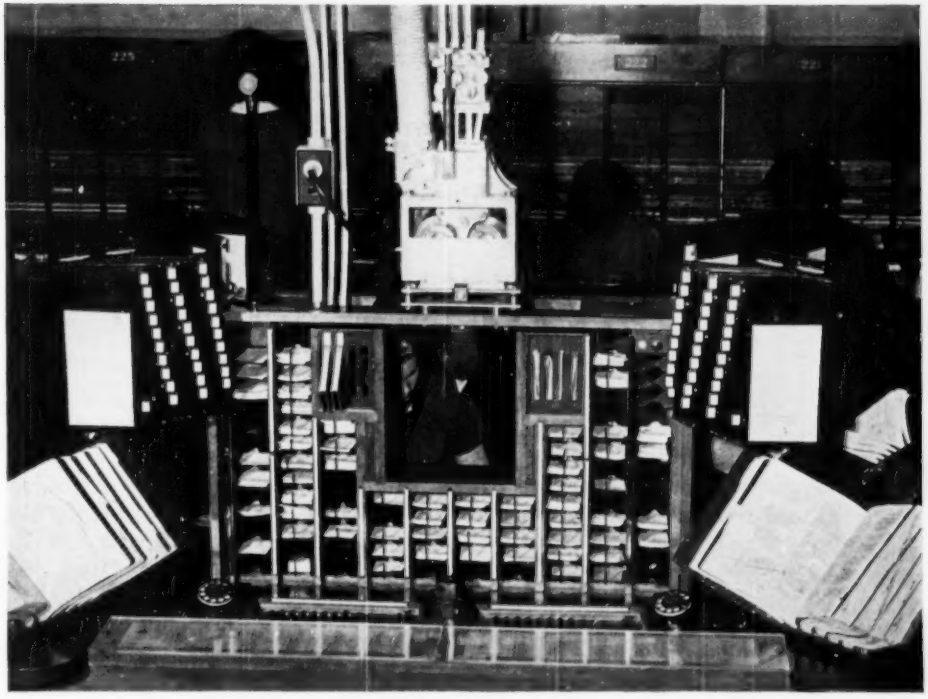
Every long distance operator has available two principal means for determining the route over which she may direct any toll call to its destination. She can call the Rate and Route Operator, who has the *Toll Rate and Route Guide* as the ultimate basic source of information, and also a fairly voluminous list of frequently called points with the route and rate already shown. But her first reference is her own position bulletin, showing information for a rather limited number of the most frequently called points, either on a flat card under the keyshelf glass or on a "multicard bulletin" which puts from 600 to a thousand or more routes at her finger tips.

Each of these sources of information has its advantages and its limitations, but, combined in suitable proportions, they furnish the "how" that the long distance operator needs.

The Basic Source

THE *Toll Rate and Route Guide* has grown with the long distance traffic of the country. It is an absolute necessity in every long distance office, for it is the device that puts the "anywhere" into the statement about being able to call anyone else anywhere else.

The guide lists all of the 100,000 or so places and vessels previously mentioned, and requires a sizable staff of people to keep it strictly up to date by issuing monthly supplements as changes occur and disseminating the revised information to nearly 5,000 copies of the Guide that are maintained in service throughout the Bell System. In its two volumes, the Guide contains 1,500 pages of listings, in addition to other information, is 5¼" thick, and weighs about 14



The records of Rate and Route Operators appear on a toll auxiliary desk in the foreground. The first reference list is the tabbed swing-leaf file at the upper corner of the ticket rack. Below that is the Toll Rate and Route Guide—a complete reference source for each of the operators. Their duties also include receiving, filing, and distributing toll tickets

pounds—not exactly a handy first-reference record.

Of course, as a commentary on life in our country and its early history, the Guide is interesting in itself. Pennsylvania seems to have more named places than any other state: 6,700. New York is second with over 3,500, and California is third with about 3,200. On the other hand, the expanse of the wide open spaces is indicated by Arizona's 440 listings and Wyoming's 355. The early citizens of no less than 56 communities in 34 states considered their towns sufficiently important to carry the name of Centerville—and today the long distance operator seeking the way to Centerville must make a choice between eight such towns if the call is directed to Pennsylvania, five if Ohio, and three each if Georgia or Illinois. Here and there one finds interesting traces of obsolete word usage, as in Smoky Ordinary, Virginia, which was perhaps the site of an inn which had a reputation for its smoky fireplaces. We see the hand of the early Spaniards still upon us in the California list which contains 11 names starting with "Los," 44 starting with "San" and 17 with

"Santa." And we may suspect that the inner thoughts of early settlers were reflected in names which they bestowed on such places as Bacchus, Better Chance, Gilt Edge, and Life.

IN THIS GUIDE, each of the points is listed as a Class 1 toll center, a Class 2 toll center, or a tributary. A toll center is an office which has been designated in the nation-wide toll plan to handle most of the long distance calls to and from its own and other near-by localities. A toll center is considered as Class 1 not because of size alone but because of its strategic location with regard to the main communication routes and the distribution of calls around it. There are only 336 Class 1 toll centers in the U. S. and Canada, and they are pretty well connected by main trunk lines—"backbone routes"—so that most of them can reach most of the others over direct circuits. In only a relatively few cases must one of these offices go through more than one intermediate switching point to reach another Class 1 office. Each Class 1 office is furnished a tailor-made sheet showing how it reaches every other Class 1 office.

The places designated in the Guide as Class 2 toll centers are also important switching points. Each is connected to one or more Class 1 centers, and the Guide states what these "outlets" are—though actually the outlet is a two-way channel; that is, a Class 1 office switches outgoing calls from its Class 2 offices to distant points and also switches calls from distant points to each of its Class 2 offices. There are about 2,300 Class 2 offices.

All the other continental points listed in the Guide are "tributaries" of a Class 1 or Class 2 toll center, and for each the Guide gives the toll center. Some tributaries are large and some are small. Factors such as geographical location, economical layout of telephone plant, and efficient operation determine whether a place is considered a toll center or a tributary. The cities of East Orange and Jersey City are "tributaries" of Newark, New Jersey, for example, while many smaller places in less densely populated areas are "toll centers."

The Guide also shows, for each vessel equipped for telephone service, which one of the radiotelephone offices to call to reach the ship; for each telephone-equipped automobile, what mobile service office normally serves it; and for each overseas point, the overseas office to which a call for that point should be directed. Thus the Guide is a world communication atlas, and hardly the thing to be consulted by an operator in the confines of a regular long distance switchboard position.

However, if it were consulted, it would show the way. An operator in Buffalo, New York, for example, with a call for Palm Springs, California, would find that Palm Springs is a tributary of San Bernardino, and that San Bernardino is a Class 2 office for which the Class 1 office she should use is Chicago.

SUCH A METHOD is too slow, too cumbersome, and too difficult for each long distance operator to use, so that the Guide is kept at a Rate and Route Desk where specially trained operators use it, and interposition trunks connect the long distance operators with this desk. The Rate and Route operators are provided also with a

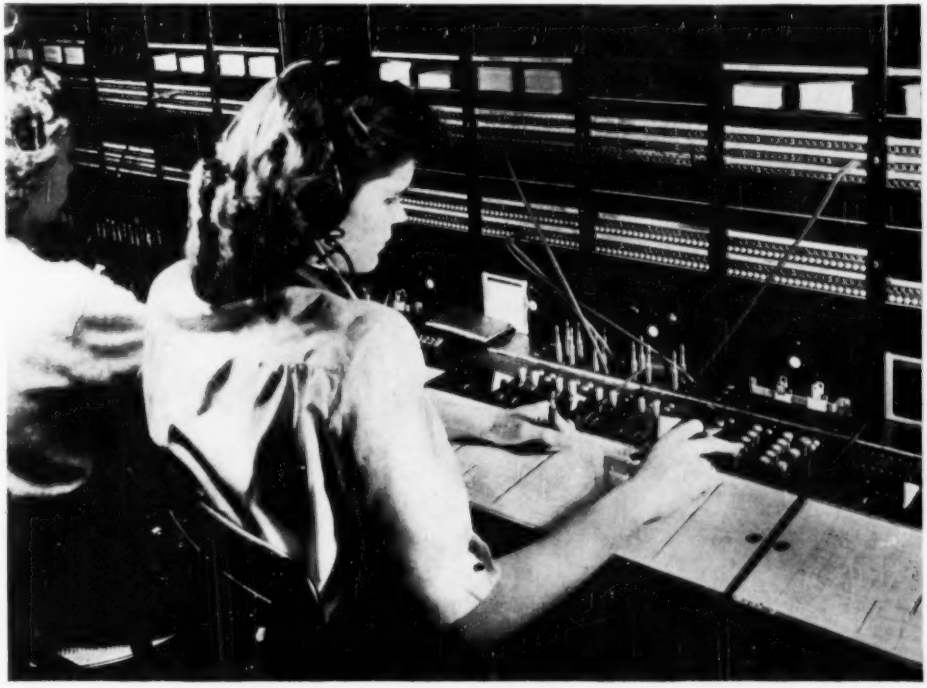
fairly extensive list of frequently called points—several thousand in many offices—from which they can supply most of the information requested. So when the Rate and Route operator receives a request for "Routes to Palm Springs, California," she consults this first reference list and, if the information is available there, she is able to give it in a matter of seconds. If it does not appear on this list, she refers to the Guide and will find the information in about a half minute. Then she will reply to the request by saying, "Toll center San Bernardino, ringdown; via Chicago"—and the long distance operator knows the way.

At present the average speed of service is 1.6 minutes for answering a long distance call at the switchboard, obtaining and recording all the necessary details from the customer, finding the way to the called place, reaching it, and completing the connection.

Operators' Own Lists

BY NO MEANS must every call be referred to the Rate and Route operator for routing instructions, however.

It has been a longstanding practice to equip each long distance position with a list of frequently called places to which the operator could quickly refer to find the route on most calls



This long distance operator's position is equipped with the largest possible "flat bulletin" —the printed sheets under the glass on which her hands rest. From it she can obtain the routes to several hundred of the most frequently called points, and other information she may require to provide fast handling of most calls

without having to obtain it from the Rate and Route operator. The glass-covered keyshelf space, on which she does her writing, provided a place where a few hundred places and the routes to them could be listed on a flat bulletin. It was only a matter of seconds for her to glance at this flat bulletin and then, if the desired place were listed there, be on her way. Since this space is limited, thousands of calls are analyzed to determine what places are most frequently called from each long distance office. As a result, in many offices a few hundred places listed on this flat bulletin will give the route on from 75 to 90 percent of all the calls made there.

As the American people have become more telephone-minded, the simple flat bulletin on the keyshelf, with its limited listing of points, has become inadequate for many offices. Not only have total volumes of long distance calls grown, but people call more different places. A man whose office is in New York City regularly calls "the folks" in Marion, Iowa; Mother in White Plains, New York, calls her daughter at school in Danville, Virginia, each Wednesday night; business men call their clients to discuss details which a decade ago would have been handled by mail. The result is that more points have to be listed on the flat bulletin, or the overall speed of connection will suffer because Long Distance has to obtain the route from the Rate and Route operator.

Moreover, to keep step with the tempo of American life, the Bell System has been introducing toll dialing to an increasing extent. Progress in this direction was signalized recently in ceremonies to commemorate the inauguration of transcontinental toll dialing. President Mark Sullivan of the Pacific Telephone and Telegraph Company talked to Dr. O. E. Buckley, President of the Bell Laboratories, and Mr. Keith S. McHugh, President of the New York Telephone Company, over a dialed connection which was completed in 12 seconds from the time the long distance operator was given the called number. As an adjunct to such a service, the old system of obtaining routes over a trunk from another operator becomes rather antiquated—like continuing to wear the old linen duster and dust goggles, say, in a 1949 convertible car.

The Effect of Operator Toll Dialing

THE MECHANICAL SWITCHING EQUIPMENT used in the operation we call "operator toll dialing" can do wonderful things, but it does not understand names. Names must be converted to distinctive codes, so all dialing routes must be expressed as arbitrary numbers—generally 3-digit numbers. Plans have been worked out for an ultimate nation-wide numbering plan, under which an operator would reach any dial telephone in the United States or Canada by dialing a maximum of 10 or 11 digits and in most cases not over seven.

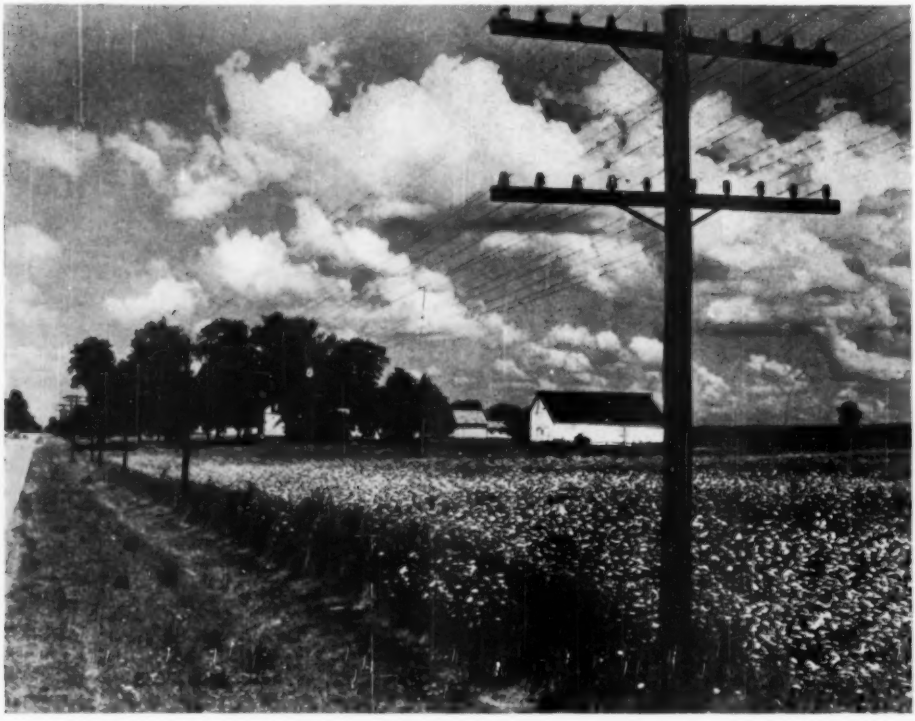
That, however, is something to be arrived at by degrees. It would be impractical to convert the entire country to toll dialing at one sweep, and it is undesirably slow to wait until everything is ready to convert even one office to dialing under that numbering plan. To permit a great many offices to start a limited amount of toll dial-

ing at once and to permit easy and gradual extension of the operation, so that the service advantages and operating economies of the method can be effected as rapidly as possible, the ultimate is being approached through transition stages.

During this transition period, each place that can dial other places has a code for each such place. If it can dial through that place to reach another, it adopts that office's code for the second place. Recalling our call to Palm Springs, California, for example—if all the equipment in the offices involved were ready for toll dialing, the calling office might have the code 312 for Chicago; Chicago might reach San Bernardino by "pulsing" (dialing) 051; and San Bernardino might have selected the code 167 for its tributary, Palm Springs. Then, if the long distance operator we have been talking about went to her Rate and Route operator for the route, she would be told, "312 plus 051 plus 167 plus."

No one would expect Long Distance to remember those nine digits correctly; she would have to write them on the ticket she has made out for the call. That takes more time before she is ready to set out on the road—operating time and customers' time; and in spite of every effort, numerals are too often misunderstood, and our call might arrive at Orlando, Florida. That is why, as we convert to toll dial-

The multi-card bulletin at a long distance position provides routes to many hundreds of the more frequently called places. The operator may obtain from it in a few seconds the information needed to speed a call on its way



The familiar "open wire" pole line extends the highways of speech to rural and sparsely settled areas, and helps to validate the "anywhere" in the scope of the Bell System's service

ing, we wish to get as many points as practicable on the switchboard bulletin. If the point is listed there, long distance can read "312 + 051 + 167 +," glance at and then pulse each code separately, without taking time to transcribe it to the ticket and with greater assurance than if she tried to remember all nine digits at once.

You probably wonder what the "plus" means. It means simply to "Keep on dialing," or "There is more dialing to be done." Between successive codes it also acts as a spacer; a nine-digit number without a break is rather frightening. At the end of a code or series of codes, the "plus" means that the operator can dial the local number if she knows it. On this call over an all-dial route to Palm Springs, for instance, as soon as she observed the code, if the customer had supplied the called number, the operator would select a trunk and dial "312—051—167," and then the local number. All 13 or 14 digits would be pulsed in less than that number of seconds, and without waiting for anything else to happen.

If the operator does not have the Palm Springs number, she is instructed to reach the Information Operator at the toll center; so, having found the code for the toll center

she would pulse that, adding "131," which is the uniform operator code for "Information." Once she had obtained the number, she would then disconnect and start over again.

Of course, since the mechanical equipment starts establishing the connection while she is still pulsing, the connection is extended to the called office or number in a matter of one to four seconds after she has finished the last digit, so the whole operation would take less time than it has taken to describe it.

AT PRESENT about 30 percent of the toll calls of the System are dialed. During the transition period, a few long distance offices are dialing on a large percent of their calls, some can dial on certain routes, and many are not yet equipped for dialing. Certain toll trunk groups are arranged for dialing, others are not. A call that started out over a dial group might entail a switch at an intermediate office to a ringdown or non-dial route. All this information must be made available to the operator who is trying to find the way. Going back to the operator seeking the way to Palm Springs, she might read from her bulletin, or be told by the Rate and Route operator, that the code was "312 plus 051." The absence of the "plus" after the second code would mean that, after she had pulsed that code, she should listen for the answer of an operator, and pass her request orally from that point on.

This digression into toll dialing codes indicates again the need for getting more listings on the long distance bulletin so that the operator will not have to enlist the help of the Rate and Route operator except on the occasional random call.

The Multi-card Bulletin

THE ANSWER to the problem of helping the operator to help herself directly to more long distance routes has been in use for some time in a few offices, and in the past three years its application has been extended rapidly. The space on the flat bulletin is being greatly augmented by a "multi-card bulletin." A few square inches of the keyshelf on each long distance position are set aside for a unit containing a number of individually hinged cards, each of which is tab-indexed in such a manner that all the tabs are visible. The operator can select at a glance the two tabs between which the called point would be found, flip the bulletin open, and quickly scan the 40-odd listings thus exposed.

About 250 toll offices have now adopted this form of record for Long Distance, and the number is growing rapidly. On the average, some six hundred to eight hundred places are listed on each multi-card bulletin. The operator should be able to "find the way" to the called place on 95 percent or more of the calls merely by a flip of the finger.

We in the Bell System wish to decrease the operation of obtaining routes from the special Rate and Route operator just as much as practicable. Not only does the call go through faster when the operator can "find the way" from her position bulletin, but operating time is saved when one operator can do this work for herself rather than asking another to do

it for her and then waiting while the second operator does it.

For these reasons we continue to study the distribution of the destination of calls placed in each long distance office; for, even with the added space that a multi-card bulletin makes available, if we tried to anticipate every eventuality, the list would soon become the same size as the Toll Rate and Route Guide. In any toll office, there are five calls or fewer per hundred which are non-recurring—or practically so. A family touring on the Pacific Coast may call "home" to Beaver Dam, Virginia, to make sure that things are going all right in their absence; or some "Stop the Music" sort of radio program in New York City may select a number in Black Springs, Arkansas, to call. Obviously, such random calls must be handled without benefit of a switchboard bulletin, and for them the Rate and Route operator supplies the route.

Some offices can cover practically their entire file of long distance calls with a list of 100 to 150 points, and for these the flat bulletin is unequaled. But experience indicates that most long distance offices need 600 to 800 listings to leave a residue of scattered calls amounting to no more than five per hundred. This is too large a list to get on a flat bulletin —and read without a magnifying glass. But it is a nice size for a multi-card bulletin.

HAVING ACCEPTED the multi-card file because its good features were valuable and serviceable to us, we have been working to minimize its bad features—the worst of which is cost of production and maintenance.

To encourage operators to use it, and to make that usage fast and accurate, we have stressed the clearness and legibility of the typography of the bulletin. That at first suggested that the job must be set up in printer's type, and many bulletins were done on that basis. It became evident, however, that such a process would be too expensive to use widely.

Hand in hand with this problem was that of making changes, for routes do not "stay put." New highways of speech are frequently being placed in service which may replace a switched routing by a direct path or may make it advisable to change a switched route from "through Chicago" to "through Omaha." And as the toll dialing program progresses, office after office and group after group are being converted to a dialing basis. Each such conversion has far-flung effects.

On the smaller, flat bulletin, the work of posting changes or of reprinting the bulletin to incorporate changes is not too great, but the multi-card bulletin is somewhat more of a problem. With the greater number of points listed in a given office, more changes are occurring in a given period of time, but still the bulletin must be kept strictly up to date or the call will be misrouted.

At this moment, the best solution to the problems of economical preparation and maintenance of the multi-card bulletin seems to be the adoption of "multilith" duplicating, an established process for producing quantities of copies already used extensively in the Bell System. In it the information is typed on special paper in the form and size desired, and these special sheets are used as plates

on the drum of the duplicating machine to produce as many copies of the cards as are necessary. If a change in route is made, the original may be erased and corrected, and corrected copies of the card re-run, literally in a matter of minutes. The typing and the operation of the machine are done by trained girls within our organization, so we are not dependent on printers' schedules or time consumed in delivery and pick-up. The finished product compares quite favorably in attractive appearance with regular printed work.

THIS STORY started out about a long distance call to Palm Springs, California, and about how the operator needed to find the way. Here we have ended talking about duplicating machines and such things as dollars and cents. That is the way things work in a large enterprise like the Bell System. The long distance service must be improved—the operator must be given means of finding the way more quickly—switchboard bulletins must be improved—the telephone company must go into the duplicating business—and, lo! it can all be done, and at less cost than previous methods.

Thus the operator has not only found the way to Palm Springs but to more efficient long distance service.

Bell System Film Receives Award

READERS who may recall Arthur F. Leet's article "You Can Tell by the Teller," in last Spring's issue of this MAGAZINE, may remember his reference there to a training film having the same title, and will perhaps be interested to learn that it has been awarded an "Oscar" at the second annual film festival of the Cleveland Film Council. The Council is an organization of business, educational, and religious groups for encouraging the use of films in adult education. About thirty employee training films were reviewed before the field was narrowed down to the eight which were shown at the festival. The film, produced originally in 1946 for the training of Bell System counter tellers in the techniques of their job and the importance of their work in fostering good customer relations, has been used extensively by banks, insurance companies, and other concerns throughout the country to train employees in showing courtesy and good will to their customers.

Pension Minimums Are Raised

BELL SYSTEM EMPLOYEES were informed during the week of November 20 that pension minimums had been increased, as of November 16, for both those now receiving pensions and those who will retire in the future.

The principal effect of the change is to provide increases in the minimum pension for full-time employees having 20 or more years of service at the time of their retirement. They will receive a minimum payment which, when added to the amount receivable from Federal Social Security—if any—, will be $100 per month after age 65 and $75 per month before that age. Many employees will receive more than these minimums.

The Benefit Plan is a fully-rounded plan, providing at no cost to the employee not only pensions but also sickness, accident, disability, and death benefits. Its eligibility provisions and the methods of computing benefits and pensions are the same for all management and non-management employees throughout the organization. Pensions, both for employees who retire at age 65 and for those who retire earlier, are based on length of service and average wages for the last ten years before retirement.

The Plan was established in 1913—nearly 37 years ago—as a "non-contributory" benefit and pension plan. It has always ranked high among the benefit and pension plans of the country, and over the years it has been amended from time to time in the light of changing conditions and in such a way that the Plan has remained sound.

The relevant paragraphs of the Plan have been amended to make the present changes effective.

War-Time Taxes on Communication Services In 1949

The following statement has been presented to Representative Robert L. Doughton, Chairman of the House Committee on Ways and Means, and to Senator Walter F. George, Chairman of the Senate Committee on Finance. Editor.

THE BELL SYSTEM'S views on continuing the war-time Federal excise taxes on communication services are presented here on behalf of the users of the Nation's 33,000,000 Bell telephones, the 800,000 stockholders. and the other hundreds of thousands whose savings have been loaned to provide the facilities through which this service is rendered.

Federal Excise Taxes on Communication Services Are Unreasonably High

LOCAL TELEPHONE SERVICE and telephone toll messages of less than 25 cents are taxed at 15 percent, while telephone toll messages over 24 cents and domestic telegrams are taxed at 25 percent. Thus, for instance, on a monthly charge of $5.00 for local service the customer pays a tax of 75 cents, and on a $1.00 toll call he pays a tax of 25 cents.

The excise taxes on Bell System business were about $13.50 per telephone for 1948, or about $1.12 per month. The taxes averaged 18.6 percent of the taxable revenues—in other words, in 1948 Bell System customers really paid 18.6 percent more for their telephone service than would otherwise have been necessary, because of these taxes.

In addition to these excise taxes which users pay, there are the Federal income and other operating taxes of the corporations which, of course, must be passed on to the users through charges for service. Including these corporate operating taxes with the excise taxes, the total 1948 taxes per Bell System telephone were about $23.30, or almost $2.00 per month.

A Business and Social Necessity Should Not Carry a Burdensome and Discriminatory Tax Load

AS FAR BACK AS 1924, the Committee on Ways and Means, in the report submitted with the Revenue Act of 1924, which repealed the then existing excise tax on certain communication services, said:

"This tax was not only a burden upon business but was a tax upon a public utility so widely used as to be a necessity."

If communication services were a necessity in 1924 because of their wide use, they are even more so today. In the last 25 years, Bell System telephones increased from 11 million to 33 million, and telephone conversations increased from 47 million daily to 125 million daily.

We believe that the excise taxes on communication services discriminate against the users of these services, as they saddle on them too great a portion of the total tax load. These users pay their shares of other taxes, as well as the high communications excises.

Excise taxes are essentially sales taxes on a few selected items. It is one thing to obtain a portion of the needed revenues of Government by the use of a general sales tax at reasonably low rates. But it becomes an entirely different matter when sales taxes on relatively few items are imposed at very high rates.

In addition to the effects of corporate income taxes and excise taxes, the double taxation of corporate income weighs particularly heavily on telephone investors.

This double taxation arises from the fact that although corporate income available for dividends has already been subjected to corporate income tax, the dividends are then taxed again as income to the recipient. The portion of the corporate income paid out in dividends is thus taxed twice. The Bell System's business is one of those on which the burden of double taxation weighs most heavily as, over a period of years, it has distributed practically all of its net income in dividends.

The over-all tax load on the business of the Bell System is enormous. Some idea of its size can be obtained by comparing it with the net returns, after income taxes, to all Bell System security holders, for 1948. If we combine Federal and other corporate taxes, excise taxes, and income taxes at the conservatively assumed rate of 20 percent on the security holders' interest and dividends from the Bell System, the total dollar tax load is *more than three times* the net returns to the security holders! In other words, Government took as its share *more than three times* the net amount that went to 800,000 stockholders and hundreds of thousands of other people from all walks of life who loaned the money to build and expand the business!

Present Excises on Communication Services Are a Carry-Over of Restrictive War-Time Taxes

THE PRESENT high excise tax rates were imposed by the Revenue Act of 1943, which became effective April 1, 1944. They are largely the result of three, rather than a single, war-time tax increases, and they are a carry-over of war-time restrictions which have no place in the peace-time

economy. To appreciate these facts, we must consider some of the steps which led up to the present situation.

From 1924 to 1932, there were no excise taxes on communication services. The Revenue Act of 1932 introduced a tax ranging from 10 cents to 20 cents on each toll message over 49 cents, with no tax on local service. This was a "depression" tax to help provide Government revenues at a time when certain of the other tax sources were drying up. Before we had fully recovered from the depression, Europe was at war. By 1941, the nation embarked on a "Defense" program, shortly to be followed by our entry into the war.

The Revenue Acts of 1941, 1942, and 1943 were enacted while we were either preparing for war or at war. Their combined effect was to tax those communication services which were not taxed under the 1932 Act and to raise the rates on all the services to the present high levels. The real war-time excises are, therefore, those imposed by the Revenue Acts of 1941, 1942, and 1943, and not just those of the 1943 Act.

There can be no doubt that in taxing all communication services and in fixing the high war-time rates, as done in these three Acts, Congress gave consideration to the necessity for conserving the existing facilities for war needs. Under war-time conditions it was impossible to meet the entire public demand for service, and the effect of the high excises in helping to prevent further overcrowding of the lines was certainly desirable. Now, of course, there is no need or desire to discourage the usage.

The 1943 Act contains a provision that six months after the termination of hostilities, excise taxes are to revert to the level of the 1942 Act. However, the Excise Tax Act of 1947 continued the rates of the 1943 Act without a definite termination date, and these are still in effect today, four years after the close of the war.

It is clear that simply going back to the 1942 Act would still leave communication services taxed at very high war-time rates, as taxes on local telephone service and toll messages less than 25 cents would be lowered only from 15 percent to 10 percent, and on toll messages over 24 cents only from 25 percent to 20 percent. The most recent peace-time tax level was really that of the 1932 Act, effective until 1941, which did not tax local telephone service or toll messages less than 50 cents.

Regulatory Authorities Are Keenly Aware of These Taxes and Have Taken a Strong Stand against Them

RATES for communication services are subject to regulation as to interstate rates by the Federal Communications Commission, and as to intrastate rates by state commissions in 46 states and the District of Columbia and by certain cities where state commissions do not have jurisdiction.

Chairman Wayne Coy of the Federal Communications Commission made several references to excise taxes on communication services in testifying before a subcommittee of the House Appropriations Committee on March 7, 1949. These references were:

"We at the Commission think it is an atrocious thing to have a tax on a communication system today.

There was reasonable ground for it when it was desired to curtail communications so as to keep within our capacity during wartime.

"How can we stand before the world and talk about a free communication system when we put a tax on it? It is as if we did not want some people to use it.

"The tax was a carry-over from the war period when we were endeavoring to hold communications to the minimum because we did not want to expand their capacity during wartime. I do not think there is any reason at all for a tax today."

The National Association of Railroad and Utilities Commissioners passed resolutions in their 1948 and 1949 annual conventions favoring repeal or reduction of Federal excise taxes on transportation and communication services. The resolution passed on August 10, 1949, reads:

"*Resolved*, That the National Association of Railroad and Utilities Commissioners is of the opinion that the present excise taxes on transportation and communication services are inimical to the maintenance of a reasonably-priced and non-discriminatory public transportation and communication service and that, accordingly, the excise tax on transportation of property should be repealed and the excise tax on other transportation and communication services should be repealed (*or greatly reduced*). . . ."

Also, retiring President Justus F. Craemer of the National Association of Railroad and Utilities Commissioners, in his address to the Association at its annual convention on August 8, 1949, said with reference to the tax results of certain telephone companies:

"These facts dramatically illustrate the unjust and discriminatory nature of the excise tax on communications service."

Conclusion

A HEALTHY, vigorous telephone system, used widely and operated efficiently, is vital to the nation in many ways. The Bell Telephone System does more than provide good telephone service, important as that is. Directly or indirectly, it touches some part of the business and social life and prosperity of almost everybody.

Millions of people outside the telephone business get some part of their livelihood from it. Telephone employees buy from local merchants. They pay local taxes as well as State and Federal income taxes, and the total of these payments is huge. Each operating company itself is a large purchaser of local materials and supplies. Last year, Western Electric—the manufacturing unit of the Bell System—bought from 27,000 different concerns in 2,800 cities and towns.

Since the war, the Bell Telephone Companies have put over $4,000,000,000 into new facilities. The money has been spent to improve telephone service and to meet heavy post-war demands in almost every community in which they operate. This has meant work and jobs for people in many, many lines.

The value and usefulness of the service this industry provides and the contributions it makes to the prosperity of the communities it serves are important to the economy of the entire nation. Therefore, it would be unwise and uneconomic to continue in effect a tax which might retard the

growth and development of such an essential service.

We therefore believe that excise taxes on communication services should be abolished as soon as possible. If they cannot be abolished completely, the first step should be to eliminate the taxes on local telephone service and on toll messages less than 50 cents, and to reduce greatly the tax rate on other toll messages. The lifting of this tax burden will be to the advantage of the millions of telephone users, the hundreds of thousands of telephone employees and stockholders, and the thousands of communities which the industry serves.

John J. Toolan, New England Telephone and Telegraph Company Plant man who was the model for Norman Rockwell's painting, "The Telephone Lineman," stands beside the first full-color reproduction of the painting to come from the press. The print, inscribed with a personal message from the artist, was given to Mr. Toolan by President Joe E. Harrell of the New England Company at a special ceremony. The picture has appeared in Bell System newspaper and magazine advertisements, and reproductions of it similar to the one Mr. Toolan received are being displayed in suitable locations throughout the System

Restoring Worn Telephone Equipment to Further Usefulness Is an Important Western Electric Function Carried On In the Shops of Its 28 Distributing Houses

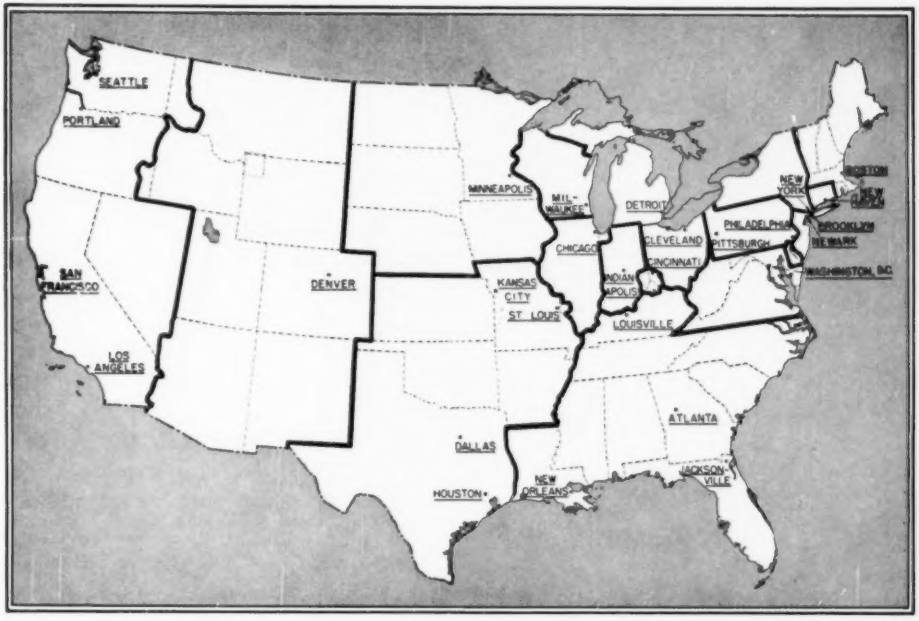
Giving New Life to Old Equipment

Philip H. Miele

THE RESPONSIBILITIES of the Western Electric Company, supply unit of the Bell System, are often cited as four: manufacturing, purchasing, distribution, and installation. That is not the whole story, however; for part of the job of keeping the telephone companies supplied with good equipment is to keep that equipment in the very best possible condition—repairing it so that, after the long years of hard service it was built to withstand, it can begin another long service life in the telephone network.

This is no small outgrowth of the Company's supply responsibilities. Repairing communications equipment is both a big and an important undertaking. Each year, for example, Western Electric's repair shops recondition and restore about 10 percent of all the Bell telephones currently in use. Then consider for a moment that the telephone is only 6 percent of the equipment in the network behind it—and you'll have an even clearer picture of the scope of Western Electric's repair job.

Some of this vast quantity of material returned by the telephone companies to Western is found, after inspection, to be in as good operating condition as the day it was made, needing only a cleaning to wipe away the scars of long service, or a slight adjustment or replacement of a part to insure even longer service. All the research and engineering, the skilled manufacturing and painstaking installation, that go into putting the telephone network together would become useless for some customers if even as small a component as a telephone transmitter should break down. That's why heading off breakdowns before they occur, rehabilitating before repairs are necessary, is of vital importance to the telephone companies in their job of rendering good and dependable service.



On this map are spotted the locations of the Western Electric Company's 28 Distributing Houses. An integral and important part of each is its Repair Shop

As distributor for the Bell System, Western Electric operates 28 distributing houses, which are strategically located throughout the nation to serve the Bell telephone companies. These houses vary in size from the one in Cincinnati, O., employing about 60 persons, to the one in New York City which employs about 1,150. They render two principal services: one, for which they are well known, distribution; and the second, less known, repairing. Of the almost 8,000 employees who work in the distributing houses, more than 5,000 are engaged in a wide variety of repair activities—activities which in turn call for almost as wide a variety of skills as are required in the manufacturing operations of both the Company and its subsidiary, Teletype Corporation.

The Scope of Shop Operations

VISIT any one of the shops and you'll be impressed by the scope of its operations. In one shop, for instance, you'll see many of the hundreds of varieties of equipment normally repaired there pouring in from the telephone company; being classified, tested, sorted into any one of numerous categories; some of it moved on again for repair, then again for a final test and inspection; packed, and stored in the warehouse until ordered again by the telephone company.

On the ground floor, old apparatus, some of it no longer manufactured by

This machine automatically washes telephone parts at 160 degrees and then dries them

the Company but still in good working order, is dismantled for salvage of whatever parts can be used in the newer models that have come along. Telephone instruments that stream in by the hundreds are channeled over to another area, visually inspected, classified, and most of them sent upstairs for repair. A considerable number of them, however—about 15 percent in this shop's case—are almost as good as new. A little cleaning, perhaps a cord changed, then a complete electrical test—and they're ready for re-use.

Upstairs, more complex repair jobs are performed: extensive "conveyorized" operations, exacting scientific ones, washing, painting, woodworking, testing, wiring—almost everything you would find in any one of the Company's manufacturing plants. Here, much the same quality originally built into Western's products is being built back into them; they leave the shop only when they are as gleaming new as the day they were made.

One young lady seems to be administering a blood transfusion. A closer look shows that she is using a newly developed machine for putting carbon crystals into telephone transmitters. In another area, someone seems to be putting parts of telephone instruments into a washing machine. He is. And right next to him are similar parts being rolled around in a drum full of shoemaker's pegs and a polishing compound. Along the conveyor line, men and women are cleaning, replacing, adjusting and repairing the inner components of the telephone instruments.

In other parts of the shop, men are busy wiring switching equipment —everything from small private switchboards to giant toll units. Complex Teletype sending and receiving machines are tested, dismantled, repaired, and tested again. Intricate

mobile telephone units are repaired or modified to conform to the latest developments in this new communications field. And in still other parts of the shop, careful cabinet-making work is going on. Old service-worn telephone booths are cleaned of their scars—the arrow-pierced hearts and scratched-in rhymes are scraped away, the broken doors fixed, and the posture of the entire booth made erect again.

Not a blood transfusion, but a new device for replacing carbon crystals in telephone transmitters

This shop, like the other 27 throughout the nation, works closely with the telephone company which it serves. It repairs equipment belonging to the telephone company; it operates on schedules that are determined by both the short- and long-term needs of the telephone company; and, while its operations are largely standardized with those of the other 27 shops, it performs some operations that are peculiar to its territory to meet special operating requirements of its customer.

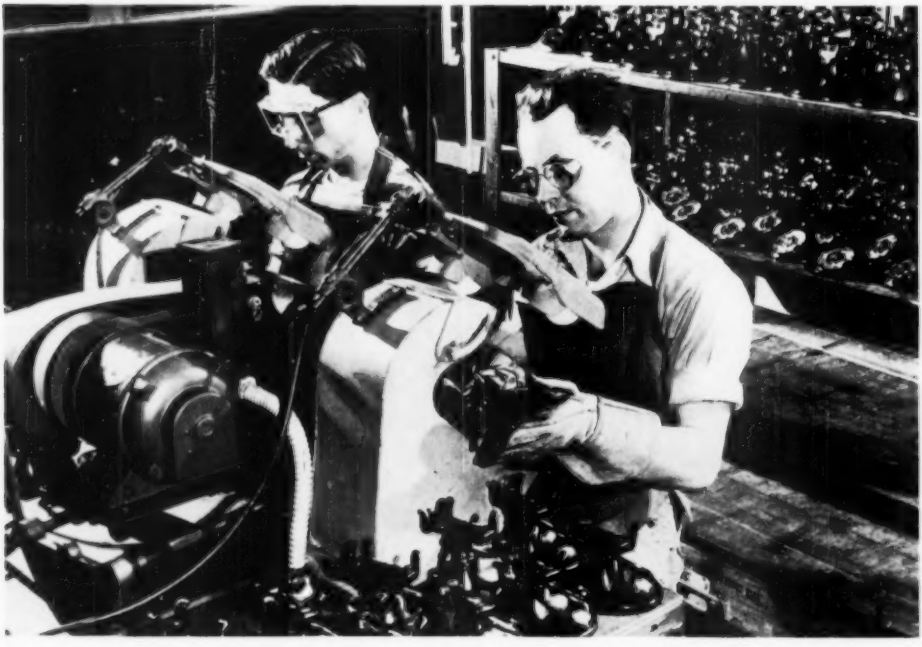
In repairing equipment belonging to the telephone company, the handling of that equipment is almost entirely determined by the needs in the field. When the equipment comes into the shop, it is classified both according to its condition (which is learned through preliminary tests) and according to what the telephone company wants done with it. If, for instance, in a particular operating area, there is a program under way of conversion from an old to a new model of apparatus, the older one is dismantled, some of its usable parts are stored for later use, and the other parts are sold to Western Electric's subsidiary, the Nassau Smelting and Refining Company, for salvage or to local junk dealers. The proceeds of the sale are credited to the telephone company. On the other hand, the telephone company determines whether repairable equipment coming into the shop is to be repaired immediately, stored for later repair, or

purchased by Western Electric for resale to other telephone companies.

Company Forecasts and Shop Schedules

THE SCHEDULES on which the shop operates are established jointly by the shop and its customer. Every three months, the telephone company issues a forecast which predicts its needs during the period. The forecast cites specific items that will be needed in specific quantities and at specific intervals. The shop, on the basis of this forecast, works with the telephone company to prepare a schedule providing, as far as possible, a uniform level of repair activity throughout the three months. Once established, this quarterly schedule remains flexible, however. At monthly meetings, sometimes weekly ones, and at times even by telephone call, the shop may modify its program to meet changed conditions in the field.

Although all 28 repair shops are geared to meet the specific requirements of the individual telephone companies which they serve, the shops are nevertheless strikingly similar to each other in their operations. Western Electric equipment is made to standard specifications, and therefore the technique of repairing it for one telephone company is the same as that of repairing it for another. This results in a similarity between the repair shops and, as we shall see later, adds up to substantial savings to the telephone companies, since repair methods and equipment may be developed for all the shops by one relatively small central staff group.

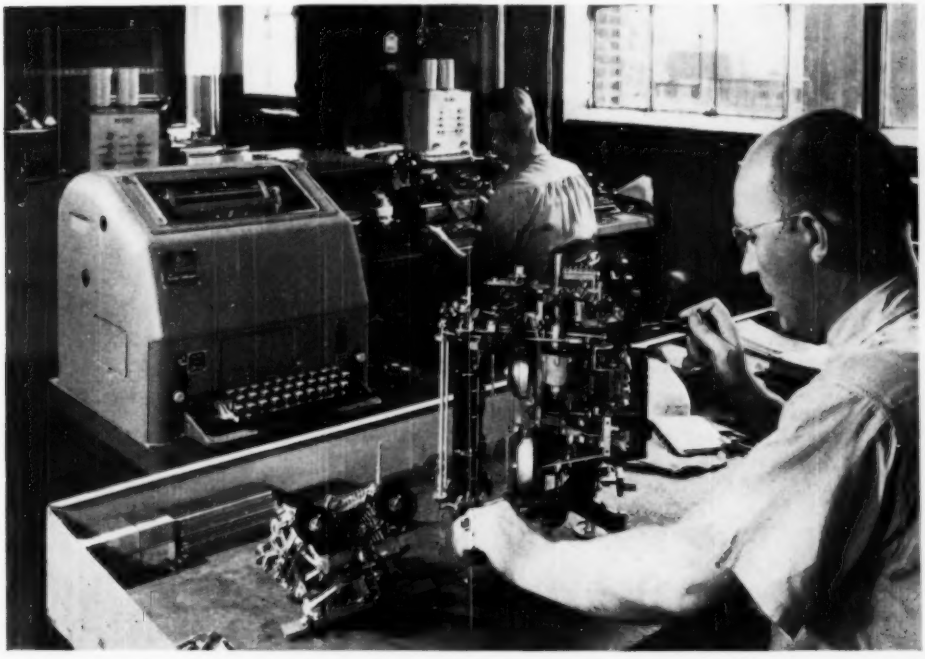


In this buffing operation, veteran telephones are cleansed of the scars of long service

There are, however, some local requirements which call for shop operations that are unique and that cannot be standardized. Here too is an example of the shoulder-to-shoulder teamwork between the shop and its customer. The telephone company may require that a switchboard recently purchased from Western Electric be modified to meet some unusual condition encountered in the field. Or it may need a piece of equipment not manufactured by Western Electric and not obtainable from other manufacturers:—a special test set for instance, or a custom-made telephone booth to match others installed years ago. These are small orders, not likely to be repeated soon, and are handled by the repair shops in coöperation with the telephone company.

An exhaustive description of the many facets of the coöperation between the shop and its telephone company customer would, in fact, be an exhaustive description of Western Electric's repair operations. So close is this coöperation that it is almost impossible to find an exact point of separation between the responsibilities of the two organizations.

Add the broad scope of activities that we have seen in this one repair shop to that of the other 27 and you will readily see that Western Electric's job of building back into its products the quality originally built into them is a big undertaking—far bigger, in fact, than it ever was. Since the war, the shops have been repairing 65 percent more telephones than ever before.



Repairing teletype apparatus is an intricate job, and a most useful one to the telephone company

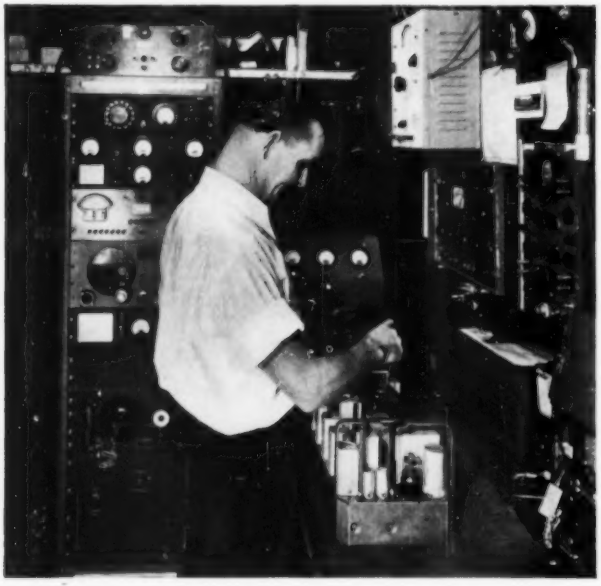
The Post-war Challenge

SINCE THE WAR, the chief concern of the repair shops, like the Company of which they are a part, has been to keep pace with the nation's growing need for telephone service, with the problems presented by changing conditions in the post-war economy, and with the latest developments in the telephone industry itself.

The nation's demand for more telephone service has resulted in an unprecedented expansion of the telephone industry. In the few years since the war's end, Western Electric has manufactured millions more telephones than were added during the previous fifteen years, bringing the total number of Bell telephones in service in this country from some nineteen million to more than thirty-three million. Labor and equipment, the basic costs of doing business, have just about doubled over pre-war levels. Meanwhile, post-war developments in the telephone industry have introduced totally new equipment in addition to basic changes in the design of much of the existing equipment in the great communications network.

If the volume of business has doubled over pre-war levels and the costs of doing business have almost doubled also, while the very nature of the business has been greatly changed by new developments, how are the repair shops meeting the responsibility of doing a bigger-than-ever job at these higher costs?

Here are two seemingly unrelated facts which illustrate the answer: first, the shops have only 33 percent more personnel than they had back in 1939; and, second, the post-war construction program calls for less than 50 percent more shop space than there was in 1939.



Mobile telephone service presented the Shops organization with a big new post-war task: gearing up for complex repair jobs. This receiving set is being fixed in a copper shielded booth in one of the shops

Double the number of telephones in service since 1939; only 33 percent more people to repair them in only 50 percent more shop space. How is this possible? The answer is that in keeping pace with the fast changing conditions that affect the shops, more than 3600 new and better methods for repairing and testing telephone

equipment, more than 725 new pieces of test and repair equipment, have been developed since the war's end: developments that cost less, require less plant, and produce better results.

Most of these developments have come from a small corps of engineers known as the Engineer of Shops organization. This central engineering group develops and makes available to the shops standardized methods and facilities that add up to better and more economical repair service for the telephone companies and insure uniformly high standards of repair work in all 28 shops. At almost any given time these engineers are busy on some 235 development projects. Savings in repair costs, where they can be measured, will be about half a million dollars this year as a result of these developments. Other savings, mostly intangible, would also be indicated by substantial figures if they could be measured.

Telephone booths which bear the marks of hard use are scraped clean of their scars and made fit for more years of service

Recent Development of the Engineer of Shops

LET'S TAKE a closer look at one of the shops and examine some of the new methods and developments that have been introduced since the war. If you'll think back to where telephone instruments were being tested and classified, you will remember that a number of them were found to need hardly any repair at all. The classification they went into is known as "rapid recovery," a post-war innovation, which calls for a complete electrical test, whatever minor repairs are necessary, and a thorough cleaning. This saves both the time and expense of the more extensive operations. Generally, telephones treated under rapid recovery are ready for the telephone company the day after their arrival.

Upstairs in the shop, the men re-

A miniature laboratory on wheels, for use in testing test sets, gets a final check in the Engineer of Shops laboratory

pairing mobile telephone equipment are working on the very frontiers of a new field. The recent addition of mobile telephony to Bell System's already long list of communications services to the public confronted the shops with the rush job of gearing to undertake this new and highly complex repair function. Even after equipment and tools were designed and personnel trained, development work on new ways of repairing mobile telephone equipment did not stop. Repair engineers found ways for calibrating monitors of high frequency transmitters which even go beyond F.C.C. requirements for transmitter accuracy. Testing receiver sets now takes less than five instead of 35 minutes because of an entirely new testing technique permitted by a recently developed signal generator.

The washing machine and the drum full of shoemaker's pegs that we saw earlier are other post-war improvements in repair techniques. They replaced eight other machines, saving both space and money. The washing machine washes a basket full of telephone parts in a special detergent, spray-rinses, then dries them with blasts of hot air—all automatically. After the washing, the dried parts are transferred to the barrel containing wooden pegs and a special dye and wax compound. Following a few minutes of tumbling, the parts are removed, nearly as gleaming bright as the day they were made.

Remember the girl who seemed to be administering a blood transfusion? She was using a machine developed since the war for replacing carbon crystals in telephone transmitters. The machine costs about one-eighth as much as the one it replaced and requires one-half the time to perform the same operation.

Here are other post-war developments that add up to better repair service for the telephone companies.

A miniature laboratory on wheels, that can be rolled like a tea-cart to any bench position in the shop, was introduced recently to check test sets. It comes fully equipped with compartments for storage of test leads, dial pulsing standards, tools, handbooks, and record-binders, and has a distribution switching panel, ten or twelve meters of various types, air oscillator and oscillograph and, in fact, all the equipment necessary for complete test set maintenance.

Elimination of several operations resulted from the development of a bench brush lathe which cleans telephone sets. The new lathe, installed as part of a conveyorized operation, eliminates cleaning by hand and makes dismounting of the telephone set before cleaning unnecessary.

A new lacquering process was adopted which permits the application of the equivalent of several coats of lacquer in one operation. The lacquer is in a more concentrated mixture than is normally used. The thinning operation can be eliminated because the lacquer and the air with which it is sprayed are heated in the new process. Along with information on this development, the central engineering group is sending the shops a special tool for measuring the thickness of the applied lacquer to .004 of an inch.

A new process of washing teletype equipment was developed, resulting in a better job and savings of both time and plant space. After washing, the teletype is rinsed and baked dry in a newly adapted infra-red oven.

Four-way savings will result from a recently designed test set for telephone dials. It will test four times as many dials in the same period of time as the old set it replaces, will permit a reduction in the number of sets required, will cost less to manufacture, and will result in lower maintenance costs.

A new method of splicing synthetic (neoprene) covered wire in the shops will save millions of feet a year. Formerly it was not economical to use short lengths left over from new coils. The new splice is small, neat, waterproof, and just as strong as the rest of the wire on which it is vulcanized.

THESE are just a few—selected almost at random—of the developments made available to the repair shops by their corps of central engineers. Each development is part of the shops' answer to higher costs, increased volume of business, and new advances in the telephone industry. But they are not the total answer; the rest, the biggest part, is that people who work in the shops and in the Engineer of Shops organization are the kind of people who can invent new and better ways of doing their jobs, who can use these advantages, and who *want to*.

The repair activities that Western Electric undertakes in fulfilling its responsibilities as supply unit of the Bell System go a long way toward justifying the confidence which the Associated Companies have in Western Electric equipment, and, in turn, the confidence which the public has in the telephone service rendered by these companies.

This is the sixth of a series of articles describing Western Electric's operations and its place in the Bell System organization. For previous articles, see this Magazine for Winter 1946–47, Autumn 1947, Autumn 1948, Winter 1948–49, and Spring 1949.

Their Politeness Goes Deep

The following paragraphs are from an article called "When Courtesy Pays Cash," by Don Wharton, which appears in "Nation's Business" for November and, in condensed form, in the "Readers' Digest" for December under the title of "The Greatest Mass Effort Ever Made by Business to Improve Telephone Manners." Editor.

THE BELL SYSTEM'S 250,000 operators probably constitute the most courteous large working force in the nation. Many people say the operators are polite because they have orders to be polite. False. Their politeness goes deeper than that, is no veneer of "Thank you" and "Please." Long before an operator has completed her training, she has begun to absorb the manners pervading the entire System. An operator in training encounters politeness all around her. Her instructor, supervisor, chief operator, the repairman who comes in to fix the switchboard—they all show the same attitude to the student that they expect her to show to customers. Courtesy is not obtained by dictate. It is interwoven in all the lessons, taught by example, suggestion, indirection.

The student continually hears the instructor speaking in a friendly, courteous manner. When she asks the student to do something, she says "Please" as naturally as in asking a customer for a number. If a student fails to say "Please," the instructor will not bark out "You forgot something." Instead, she will give the student chance after chance to correct this defect, then as a last resort approach the problem quietly: "What do you say in your home when you ask someone to do something for you?"

Recently, in a Philadelphia exchange I put on earphones and listened in on two student operators. They were 17 year old girls, just graduated from high school, in training only three days. They lacked confidence and made technical mistakes. But already they were getting a helpful, friendly tone in their voices. Later I asked one of them when she would argue with a customer—a tricky question. She instantly replied, "I don't think I'd ever." No one in the telephone company had told her this.

Beginners are now taught to be natural rather than formal. They say, "I'm sorry" rather than "I am sorry" and "I'll see" rather than "I shall see." Another principle is to be more personal. They ask, "Do you know the number?" rather than "What is the number?" Or "May I help you?" rather than "What information do you wish, please?" . . .

Did you ever notice how interested a long-distance operator seems in completing a call? It's not feigned. She *sounds* interested because she *is* interested. The Bell System has a saying that "every call is important to the person calling." Courtesy in the telephone business began about 1880, when the rude remarks of teen-age boy operators became unbearable. These boisterous boys, threatening and cursing subscribers, were replaced by young women —a heretical idea then. By 1890, women operated practically all Bell System daytime switchboards, and with the twentieth century they began working at night. The slogan "The Voice With a Smile" came in 1912.

About 160,000,000 telephone conversations are held in this country every business day. What would life be like in America if these calls were handled by disgruntled, discourteous operators?

Special Bell System Facilities Provide Means of Swift Communication Essential to the Operation of the Nation's Far-flung Air Transport Industry

Private Line Services for The Aviation Industry

Henry V. Roumfort

BY ANY STANDARD, the growth of air transportation has been remarkable. In 1935, for example, approximately 280 million revenue passenger miles were flown, while in 1948 the figure was 5.8 billion. Passenger miles flown now equal more than half the railroad passenger miles in Pullman space.

Three goals of the air line industry are safety, speed, and efficiency. In this triangle, communications are perhaps the vital link that permits an ever closer degree of attainment.

Domestic air transportation is furnished by sixteen trunk lines and twelve feeder lines. Private line services are used by all of the sixteen trunk lines and most of the twelve feeder lines to handle the great majority of fast communications—exclusive of plane to ground messages. Plane to ground messages are necessarily handled by radio between a plane in flight and a radio land station, but are often relayed over a wire network to their final destinations.

The first private line service used by an air line was a teletypewriter service established for the Transcontinental Air Transport Company between Columbus, Ohio, and Los Angeles, California, on April 1, 1929. Now the trunk and feeder lines have networks, some nation-wide, of both private line telephone and teletypewriter services, serving their operating areas. These networks use about 30,000 miles of telephone and 100,000 miles of teletypewriter inter-city services furnished by the Bell System.

The industry has always, and quite properly, concentrated on flight safety, and the results are common knowledge. Insurance companies have accepted travel by air as an insurable risk, comparable with other types of common carrier transportation, and investment and banking concerns look upon the industry as a sound and growing business venture.

All this is a far cry from the early days in the 'twenties when night flights were not attempted and even mildly bad weather was a bar to takeoffs. The part played by the Civil Aeronautics Administration in developments in the industry during this period was of incalcuable value.*

The speed of air travel is probably its greatest advantage over other forms of transportation. While the airplanes used in the early days of scheduled flying cruised at less than 100 miles per hour, speeds of 300 miles per hour are now common. As one can easily visualize, such present-day speeds require efficient and readily available communication systems to insure prompt and rapid overall transmission of messages along a flight route.

The first scheduled transcontinental trips were made by flying during the day and riding in a train by night. The speed of modern aircraft now permits a one-stop flight across the country in less than twelve hours. Such high speeds, which incidentally are not confined to through routes, are responsible for the exacting communications requirements of the air lines industry.

For efficient operation, a plane must maintain its flight schedule in good weather or bad, and it must fly with a load which brings a revenue sufficient to insure profitable operation. Proper use of communications helps keep planes filled and flying

Organization of an Air Line

IN CERTAIN ADMINISTRATIVE FUNCTIONS, an air line does not differ from other industrial firms. The communications justifying private line service are originated by three major air line functions: operations, reservations, and maintenance.

It is these which require some method of fast communications. All types of communication facilities have been used, and the present systems are the results of years of development and trials. New methods, new equipment are still contantly being tried, to help develop and operate communication systems which will insure good service and provide maximum safety.

Most air lines have similar forms of organization, and the functions performed by the various departments differ little between air lines. The larger the air line, simply, the more staff employees are required to take care of specific functions which in a smaller concern may be combined under one head.

As reservations, operations, and maintenance all require communication facilities, the control of communications is usually under one of these departments. Actually, most air lines have a separate organization within one or another of these departments to handle communications.

THE OPERATIONS DEPARTMENT is responsible for dispatching aircraft, controlling aircraft while in flight, making pre-flight arrangements, and it may have other duties too. Although reservations traffic constitutes the bulk of the ground communications on commercial air lines, operations communications take top priority, since they concern such prime factors as safety, schedule reliability, and similar basic operations. Some-

* See "Guardians of the Skyways," MAGAZINE, Autumn 1945.

The role of communication services in the air transport industry is to keep planes filled and flying

times there may be, in addition to an operations department, a flight control department which has charge of the actual flights of aircraft. Such functions, however, fall within the general category of "operations."

Before a flight, the Civil Aeronautics Administration, the Federal Government regulatory body, requires that a proposed schedule of the flight —a flight plan—be filed with its control office in the area in which the flight originates. This gives information about such things as loading, fuel, airspeed, altitude, time in air, route, time of arrival, destination, and weather conditions. The CAA, through Airways Traffic Control, then clears the plane on its flight and keeps check on it while it is airborne.

Coincident with departure, the air line must send a report to all its stations at which the plane will stop, giving them the time the plane will arrive and the load factors: how many passengers aboard and their destinations, cargo, and fuel requirements. These reports are transmitted by private line service, usually teletypewriter. While en route, the plane is in radio contact with either ATC or its own company's stations, giving regular position and progress reports. Company stations, upon receipt of reports, transmit the information over private line services to a control point. When the plane lands at its destination, a report of arrival is transmitted to the control point. The same procedures are fol-

lowed for subsequent take-offs and landings of each plane.

It is essential that adequate communication facilities be available to handle the thousands of messages that are required for transmitting these reports and instructions each day. A recent study of the communications of an operations department of one air line showed that nearly 10,000 messages a day were being handled. Furthermore, about half of these messages were addressed to more than one station. When such volumes are related to an air line's operating schedules, it becomes apparent that the private line network must not only be capable of carrying the volume of traffic offered but that it must also have sufficient capacity to handle it with a minimum of delay.

Handling Reservations

"RESERVATIONS" involves the procedures by which a passenger seat or "space" is made available in advance, to a person desiring to travel by air, and held so that it cannot be sold again to another passanger.

There are three general methods of handling reservations now in use by the air lines. These are termed "sell and record," "request and confirm," and "space allocation."

This is the relay center of an air line's teletypewriter network, showing the use of standard equipment

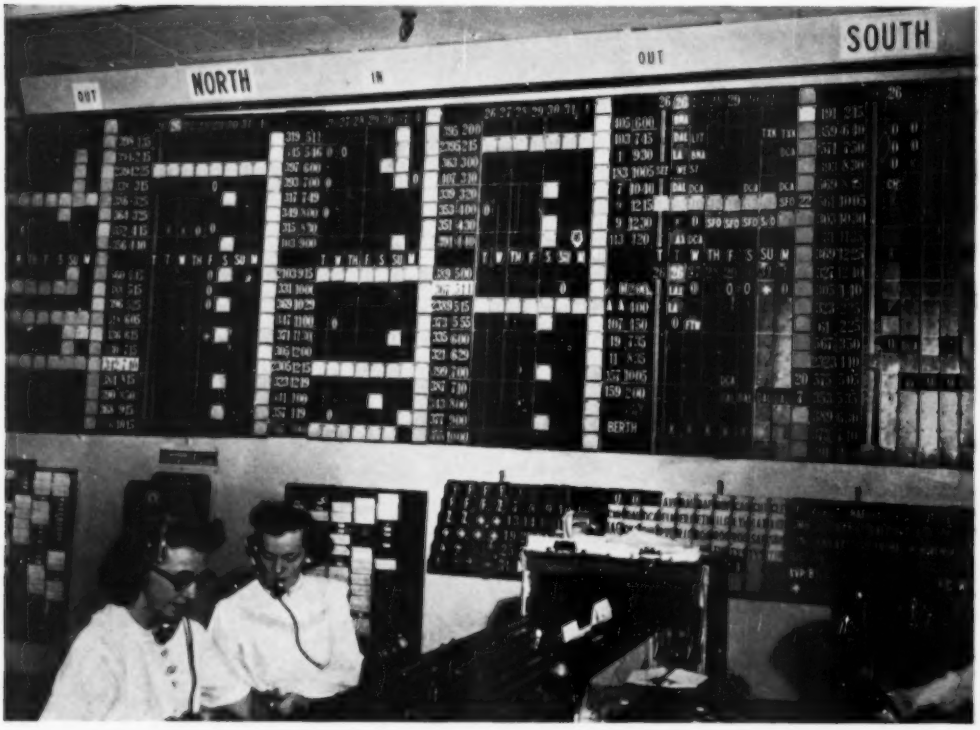
Right: Through this switching center of an automatic teletypewriter system, any office on the private line network can reach any other office without intermediate handling of messages

Left: Here is the control panel in the switching center, shown above, of an automatic teletypewriter system

Sell and record is used by the majority of the air lines, although slightly modified in each case to conform to the requirements of a particular air line. Under the *sell and record* method, each office sells space on any flight and then transmits a record of the sale to a space control point, where the sale is recorded. Elaborate records, which are in effect an inventory of space for all flights, are maintained at these points. Such records must indicate the sale of a seat for each section of all flights, current and future. When a flight is sold out except for two or three seats called a "cushion," a "stop sale" order is transmitted to all points from the control point. If the offices receive further orders for space on that flight, they handle them by a *request and confirm* system.

This method generally will provide a speedier reservation transaction than that which will be obtained when the *request and confirm* method is used.

The *request and confirm* system is not used as extensively as the *sell and record* system. All space is controlled at a central point or points; and upon receipt of a request for space, an office transmits the request to a control point, the control point ascertains from its records whether space is available, and confirms or denies the request. While accurate insofar as informing the air traveler that space is available and a reservation made, this system is generally slower in operation than the *sell and record* system; for a call back to the customer to confirm space is usually necessary, and each reservation re-



This availability chart in New York gives the reservation agents complete information about flights on which passengers may be booked. The agents at the left, wearing head sets, are located at extension positions of Long Lines full period circuits (i.e., private long distance telephone lines) and can answer any one of four circuits at these positions

quires a question to and an answer from the control point.

Space Allocation. When experience indicates a recurring requirement for a certain number of seats on a flight from a specific point, this system may be used, generally in combination with a *request and confirm* system. This method allocates a certain number of seats to a station where the requirement exists. That station is assured of the allotted space which may still be available after a stop-sale order is transmitted (where a combination system is used). Some small lines may use this system alone. When a station has sold all of the space alloted, it must communicate with other stations to locate the desired space.

Usually a combination of these systems is used by an airline. When more than one control center is employed, each center will cover one region of the area served. Most reservation communications, including inter-control-center traffic, are transmitted over private line teletypewriter or private line telephone service.

Some idea of the tremendous number of messages needed between an air line's offices to complete reservation transactions can be obtained

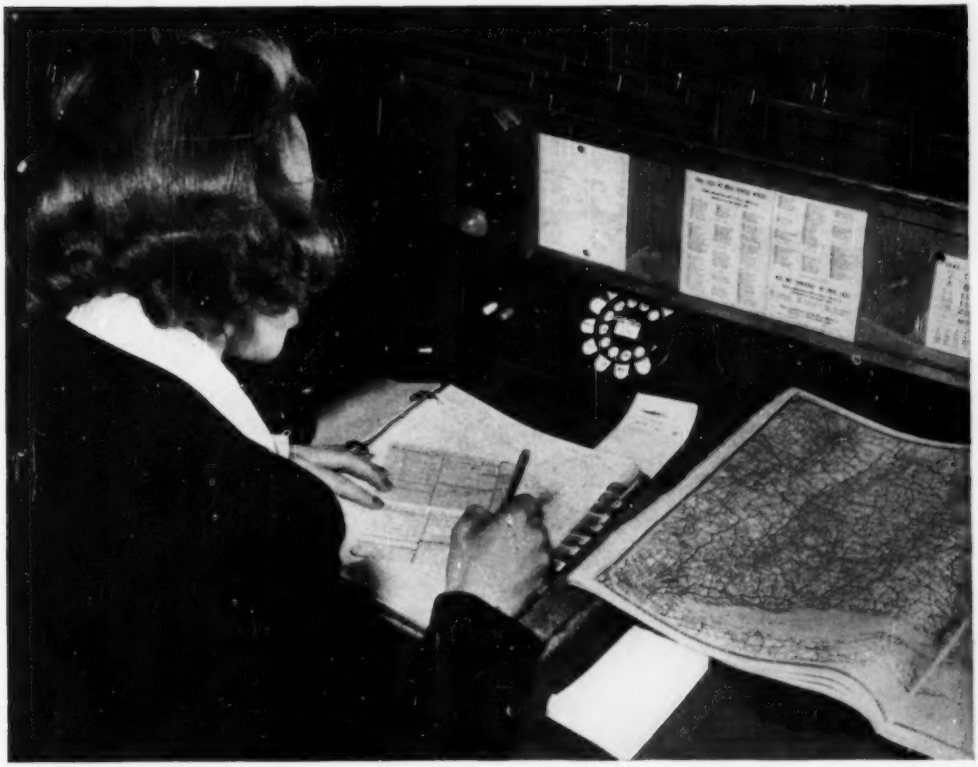
from a study of traffic handled over a private line network. A recent study for one customer—and not the largest—showed that during one day over 16,000 messages pertaining to reservations were transmitted. Of these, almost 1,000 were addressed to more than one station.

Maintenance

AN AIRCRAFT must always be in prime working order. It is kept so by the maintenance department, which makes all necessary repairs and overhauls. Various types of maintenance are important integral parts of the air line operation.

Line maintenance includes mechanical work performed on aircraft and engines which is accomplished without removing the plane from service. Such maintenance is done between flights, and all stations of the air line are equipped to perform this type of maintenance.

For preventative maintenance, each air line follows a schedule of inspection of aircraft which is established by the CAA. These are called "checks," and come after specified hours of flying time. After a plane



This reservation agent is working at a No. 4 Order Turret, where she accepts or confirms reservations, talking with customers through local wires and a PBX furnished by an Associated Company. When she has filled out the card in her hand, she will place it on the moving belt in front of her, to be carried along to the space control agent

Full period circuits (private long distance telephone lines) terminate at the control positions, shown in the foreground, in the New York office of an air line. At this point, for example, terminate direct circuits to Dallas, to Chicago through Buffalo and Detroit, to Chicago through Washington and Cincinnati, and to Boston

has flown 25 hours, for example, certain items of equipment are checked and tested; after 50 hours the same items are checked again, as well as some additional items. At 75 hours another "25 hour" check is performed; at 100 hours a "100 hour" check, which is more comprehensive than the 50 hour—and so on. Certain stations are equipped to provide 25 hour checks; others, the more extensive checks. Overhaul is extensive maintenance which is done periodically and which requires that the plane be out of service for a protracted time.

The coördination of a far-flung maintenance personnel requires the use of fast communications. Stations must report to the central maintenance location what inspections, checks, or maintenance have been performed, and the scheduling of aircraft must be coördinated so that planes arrive at stations where facilities are available to complete the necessary maintenance. Although this communication requirement does not furnish a large volume of traffic, it is necessary for safety, speed, and efficiency.

Types of Service

THE AIR LINES use private line telephone or private line teletypewriter services and combinations of both.

The choice of either service is affected by consideration of the advantages each offers, together with a knowledge of the volumes of messages and the requirement for speed.

To a large degree, over-all volumes have generally limited an air line to a single type of private line service. Where the volume is insufficient to justify both telephone and teletypewriter services, it has been found that the latter service will most nearly meet the majority of requirements. Therefore, the smaller air line customers have installed private line teletypewriter service; and for those communications which require discussion, they have used toll telephone service.

There are several specific requirements for a private line service that are commonly found when the traffic of an air line company is studied. In general, a service will parallel a flight route and have a service point at each airport along the route. When the private line is to be used to handle all traffic, the station arrangements must be such as to permit access by all departments. Importantly, where there are several circuits in the network, efficient arrangements must be provided so that a station on one circuit can exchange messages with a station on another circuit. Teletypewriter service offers many advantages in meeting such requirements. Moreover, because of the availability of reperforators, it is particularly well adapted for handling traffic that must be exchanged between circuits.

When traffic volumes are very high,

This communication equipment is at an intermediate office of an air line, where agents handle transactions with both the public and other agents of the line, using local telephone lines and Long Lines circuits. The file in the center of the table revolves, so that any agent may know at once the space available for any flight

there are many advantages to be obtained by using both telephone and teletypewriter private line services. Properly engineered, a telephone service can provide a higher speed of service, and if efficiently used can offer a greater capacity for handling traffic. An example is the growing use of telephone service to handle reservation transactions. Several of the larger airlines are now using full-period telephone networks, supplementing their teletypewriter networks, to care for reservation traffic.

WELL DESIGNED communication systems are a necessity for air line operations.

The speed at which aircraft travel requires some means for handling operations, reservations, and flight control traffic which is appreciably faster than the scheduled flying time between the points involved.

Space reservation systems require coördination between sales offices and control points. This is necessary in order to meet competition in giving good customer service and to insure the greatest possible pay load on each flight.

Fast communications are necessary to meet emergency conditions involving human lives.

Well engineered and efficiently operated communication systems have contributed extensively to the development of present-day speed, reliability, and efficiency of the air transport industry. Through its research activities and its widespread organization, the Bell System will continue to keep abreast of its responsibilities and its opportunities in this still-young field.

EVERY once in a while, a Bell System operator finds it hard to live up to her reputation for working wonders. Take this case reported by the Southwestern Bell Telephone Company.

A woman in Fort Worth, Tex., dialed long distance and asked to have a call put through to her brother in Colorado. "Is that Colorado City?" asked the operator. "No, just Colorado." "Colorado Springs?" "No, the *State* of Colorado—and please hurry, operator!"

Bewildered, the operator explained that it was almost impossible to locate a man in the state of Colorado without knowing approximately what town he was in. But the customer had an answer for that one.

"Well," she asked sternly, "you can *try*, can't you?"

Twenty-five Years Ago in the
BELL TELEPHONE QUARTERLY

Items from Volume III, Number 4, October 1924

The Telephone's Part in Defense Test Day

THAT America's electrical communication facilities, and particularly its nation-wide telephone system, are constantly prepared to meet any demand for service was demonstrated on the evening of September 12, when 38,000 miles of Bell System wire were placed at the disposal of the War Department as a part of the Defense Test Day program.

This network of circuits connected the headquarters of Army Corps Areas in San Francisco, Omaha, Chicago, and New York direct with Washington, where General John J. Pershing and a distinguished company of army officers and government officials listened to reports of the generals commanding these areas as to the results of day's activities.

These reports and a number of addresses which were made at Washington were heard by a vast radio audience through eighteen widely scattered broadcasting stations which had been connected with the circuit. This was the most widespread combination of wires and broadcasting stations thus far recorded, the stations extending from Boston to San Francisco and from Minneapolis to Atlanta and Dallas.

It was significantly pointed out by Brigadier General John J. Carty * of the Officers' Reserve Corps, who had charge of the communication features of the test, that while these stations were connected with the wires, for the purposes of the test, so that the radio listeners might hear the conversations taking place over them, this would not be the case in the event of an actual national emergency, when the messages would reach only the individuals for whom they were intended. . . .

General Carty then "called the roll of the continent," receiving immediate answers as, in rapid succession, he called fourteen cities and towns extending from New York to San Francisco. He then called Major General Morton, commanding the Ninth Corps Area, San Francisco; Major General Duncan, commanding the Seventh Corps Area, Omaha; Major General Hale, commanding the Sixth Corps Area, Chicago; and Major General Bullard, commanding the Second Corps Area, New York.

General Pershing talked briefly with each of these officers, receiving their reports on the success of the test in their respective areas. Particular interest was given to these conversations by reason of the fact that this was General Pershing's last opportunity to speak directly with his fellow officers as their commanding general, as his official retirement as General of the Armies of the United States, because of having reached the age limit, was scheduled for noon of the next day.

Army officers and officials of the War Department were outspoken in their praise of the efficient manner in which the communication features of the test were handled.

* At that time a Vice President of the A. T. & T. Co.

Royalty Visits Walker Street

THE LONG LINES OFFICES of the American Telephone and Telegraph Company at 24 Walker Street were among the points of

interest visited by the Prince of Wales during his recent visit to New York.

After being besieged by curious crowds which lined the curbs and filled the windows of the financial district, which he had just visited, the royal guest seemed impressed by the contrast presented by row upon row of operators busy at their switchboards. In spite of the fact that news of the presence of the heir to the British throne had quickly passed through the building, not a single operator so much as turned her head as the distinguished visitor passed, according to the members of the reception committee, which consisted of representatives of the Plant and Traffic Departments.

The prince appeared keenly interested in the handling of the long distance traffic to and from New York and asked many questions in regard to the number of calls handled, hours of work, rest periods, and similar details. He seemed particularly interested in the provisions for the comfort of the operators when off duty and spoke appreciatively of the rest rooms and lunch room.

Pan-American Radio Convention

AT THE Inter-American Conference on Electrical Communications held recently in Mexico City, the Bell System was informally represented by Vice President E. S. Wilson, Lloyd Espenschied, and E. S. Hawley, of the American Telephone and Telegraph Company.

The Conference was called for the purpose of discussing means and methods for the future development and improvement of electrical communications between the Pan-American countries. The Conference opened on May 27th with a formal welcome by President Obregon and continued in session until the latter part of July. Delegates were sent by fifteen governments, including Mexico and the United States, who met as an Inter-American Committee to study the situation and report their conclusions to the governing board of the Pan-American Union. . . .

The delegates representing the United States Government recommended the encouragement of private initiative and investment of capital under proper safeguards as the best and most practicable means of extending and developing facilities for Pan-American communications, and stated that their government favored private ownership and operation of electrical communication facilities, subject to just governmental regulation without undue interference with the rights of management. Other delegates were inclined to favor government ownership and operation, under conditions prevailing at present in their countries.

Who's Who & What's What

(Continued from page 131)

Omar Bradley's headquarters in Europe. The war over, he continued his education, and graduated in economics. Since 1945 he has been with the Information Department of the Western Electric Company, where his assignments include such matters as press relations and, occasionally, things like stories on repair shops. In preparing his contribution to this issue, he notes, he consulted F. W. Robinson, of Western's Central Engineering group, so frequently and to such advantage that Mr. Robinson should be thanked publicly for his "patience and spirited coöperation."

AMERICAN TELEPHONE & TELEGRAPH CO.
AND ASSOCIATED COMPANIES